

GENERAL OVERVIEW

A research and technology organization

Institute of Research and Technology (IRT)
Non-profit Scientific Cooperation Foundation

Paris-Saclay • Lyon • Singapour



100

Economic partners
of which **1/3** are large
groups and **2/3** are SMEs



+25

Academic
partners

Leads market-driven and applied
research projects for the digital
transformation of industry,
services and territories:

- 1 Expertise: analysis, modeling,
simulation and decision
management
- 2 Own skills
- 3 Own assets: software, cyber-
physical and tool-based
platforms

4 main application sectors



Mobility and
autonomous transport



Industry of the future

8 scientific and technical fields



Data science
and AI



Human-machine
interaction



Scientific
computing



Optimization



System engineering
and software design



Safety
of critical systems



Digital security
and blockchain



IoT
and future networks



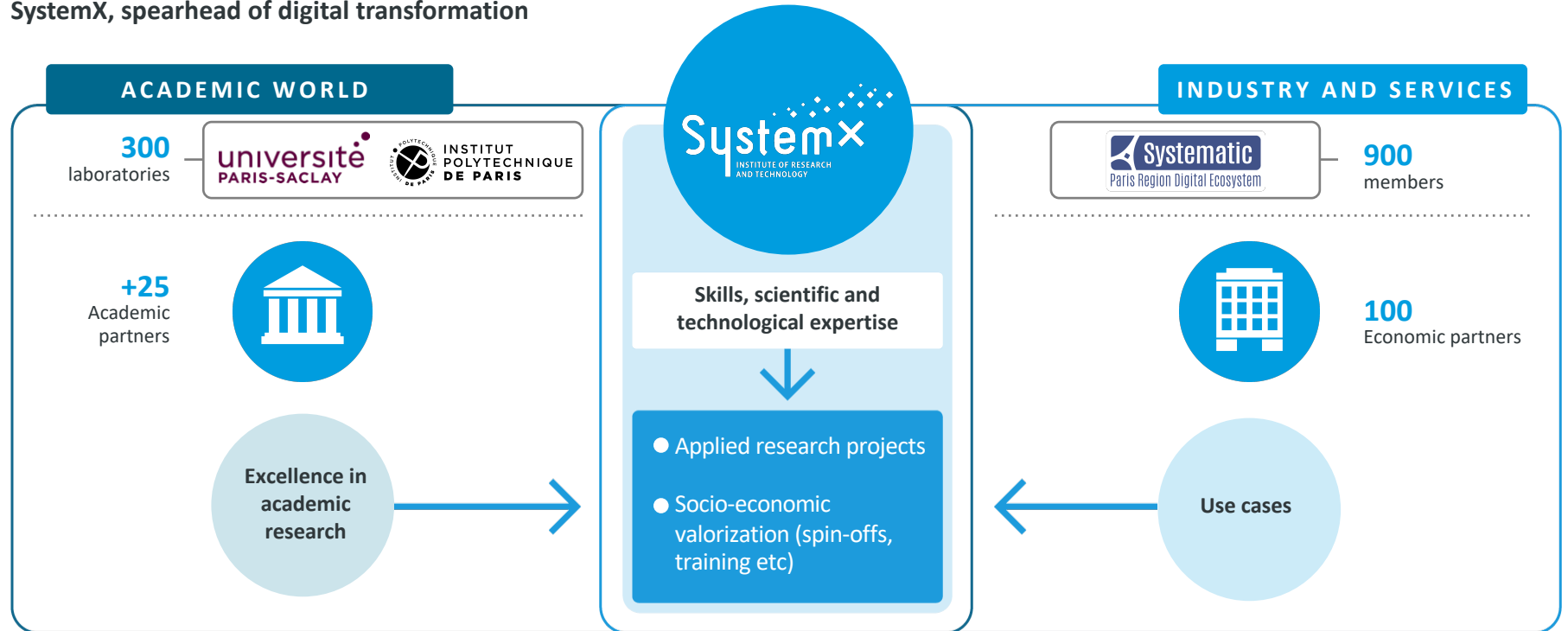
Defense and security



Environment and
sustainable development

Founding members

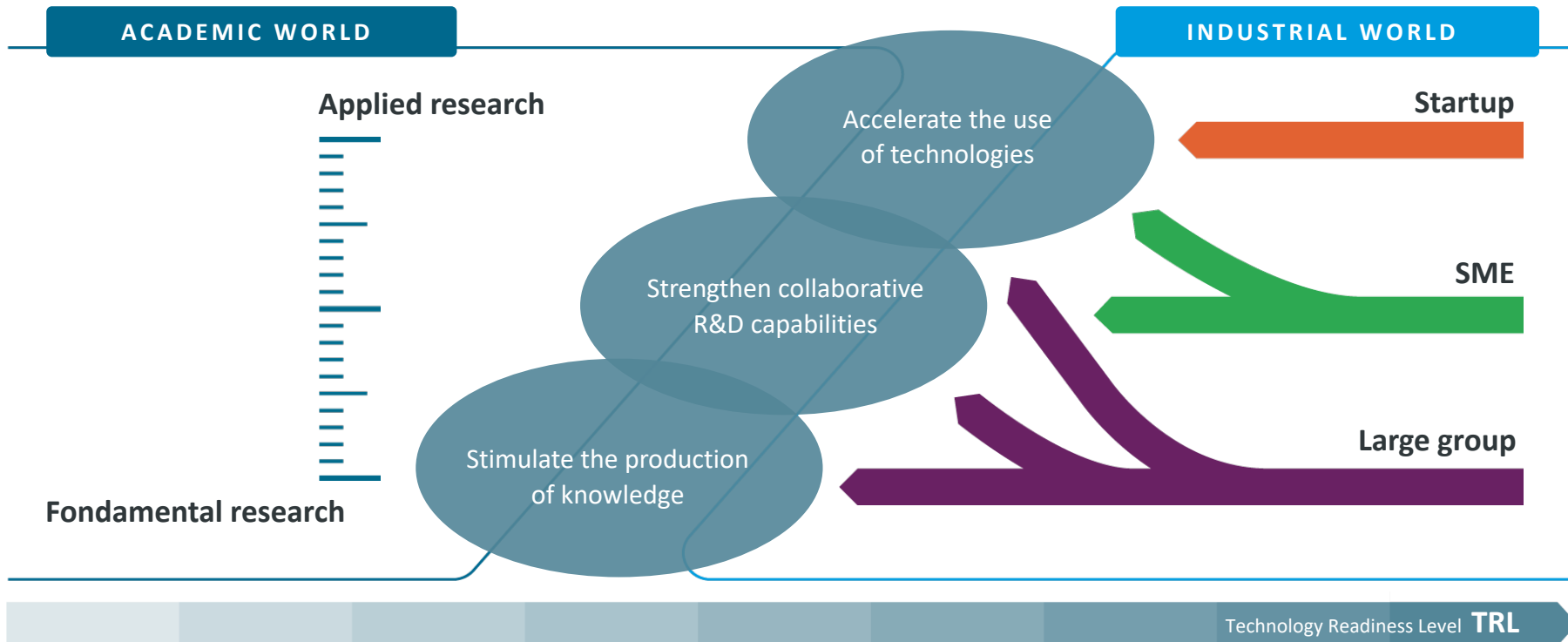
SystemX, spearhead of digital transformation



A UNIQUE VALUE PROPOSITION

A melting pot of interaction between the academic and industrial worlds

SystemX, spearhead of digital transformation



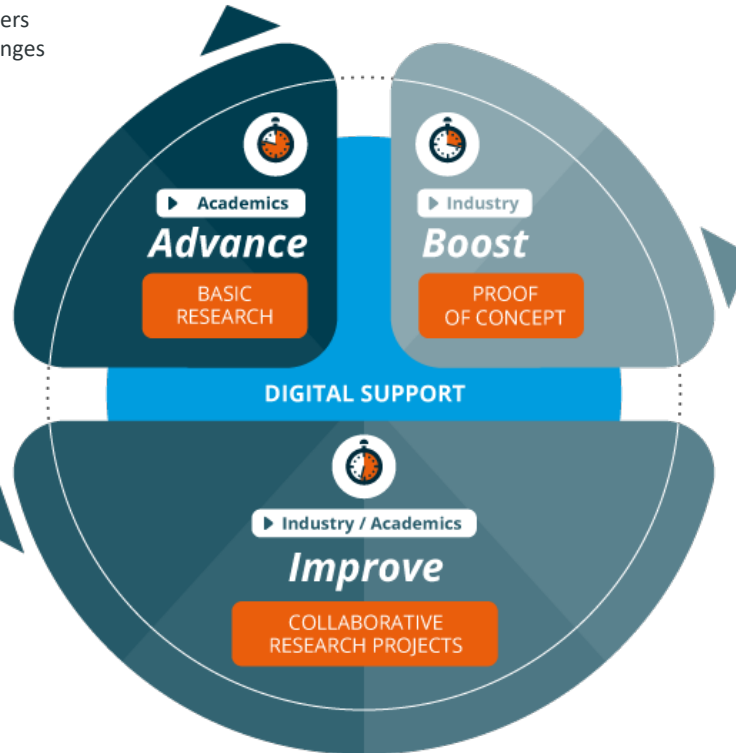
A threefold value proposition

Stimulate the production of knowledge

- Federation of academic partners around major scientific challenges
- Coordination and support of doctoral programs

Strengthen the collaborative R&D capacities of companies

- Resolving scientific and technical obstacles
- Accompanying the rise in skills of partners



Accelerate the use of technology for the value creation

- Responding to innovation challenges
- Carrying out pre-industrial proofs of concepts

LARGE GROUPS



STARTUP



ADMINISTRATIONS



COMPETITIVENESS CLUSTERS



TERRITORIAL ACTORS



SME / ETI



ACADEMIC

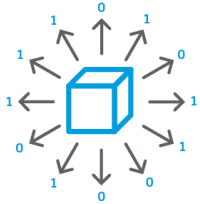


INDUSTRIES



DATA SCIENCE AND INTERACTION

Understanding the real world through data



Data science
and AI



Human-computer
interaction



SCIENTIFIC COMPUTATION AND OPTIMIZATION

Understanding the real world through physical modeling



Scientific calculation

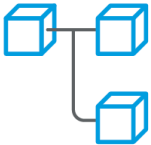


Optimization



SYSTEMS AND SOFTWARE ENGINEERING

Formalizing complex systems design



System Engineering and
Software Design



Dependability of
critical systems



INFRASTRUCTURE AND NETWORKS

Ensuring exchanges between
information system components



Digital security
and blockchain



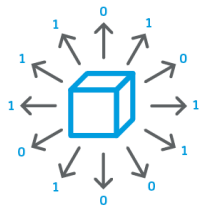
IoT and
networks of the future



Seven Research & Technology teams

DATA SCIENCE AND INTERACTION

Data science, AI and Interaction



Loïc CANTAT
Team Manager

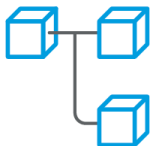


Georges HEBRAIL
Head of the Data science
and Interaction axis

19 research engineers

SYSTEMS AND SOFTWARE ENGINEERING

System engineering and Safety



Mohamed TLIG
Team Manager



Ali KOUDRI
Head of System
Engineering and
Dependability axis

13 research engineers

Software & DevOps digital support



Bruno FOYER (*acting*)
Director of Research
and Technologies

13 research engineers

SCIENTIFIC CALCULATION AND OPTIMIZATION

Scientific computation and Optimization



Rim KADDAH
Team Manager



Jakob PUCHINGER
Head of Scientific calculation
and Optimization axis

8 research engineers

INFRASTRUCTURES AND NETWORKS

Digital security

Blockchain

IoT and future
networks



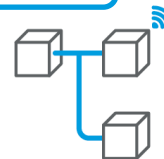
Reda YAICH
Team Manager



Nicolas HEULOT
Team Manager



Makhlof HADJI
Team Manager and Head of Digital
Infrastructures axis



10 research engineers

11 research engineers

7 research engineers

MAIN APPLICATION SECTORS

Towards the digital transformation of industry, services and territories



Mobility and Autonomous transport

Proposing innovative mobility solutions to support the transformation of territories and uses



Industry of the future

Anticipating the evolution of systems life cycles to reinforce industry performance



Defense and Security

Developing complete security solutions for a trusted digital economy



Environment and Sustainable development

Harnessing the potential of digital technology to support the ecological transition

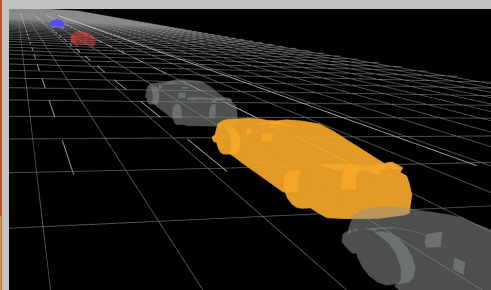


Mobility and Autonomous transport

Proposing innovative
mobility solutions to
support the
transformation of
territories and uses

Issues addressed:

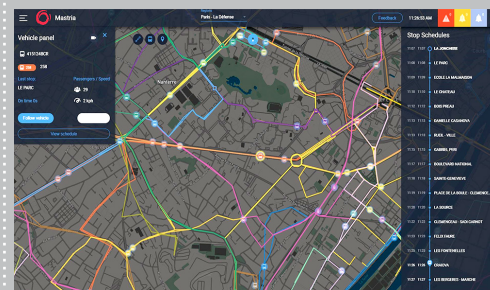
1 Security



2 Adaptability



3 Durability



Coupling scientific / industrial challenges:

New approaches to the demonstration of autonomous transport safety using rolling data and numerical models.

New architectures of connected and secure interoperable autonomous transport systems.

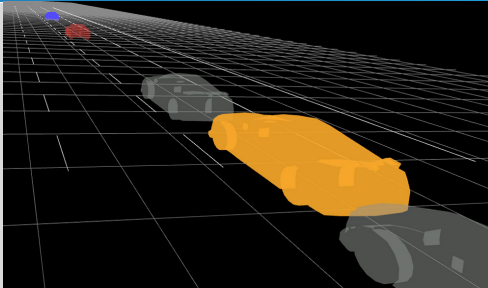
Agile operation and real-time adaptation of shared public transport plans integrating knowledge and load prediction.

HMI design adaptable to sensory multi-modality to reduce users' cognitive load and improve their intuitiveness.

Multicriteria optimization for the route request and their achievements in a Mobility as a Service (MaaS) context.

Interoperability of carpooling platforms and management of combined offers of multimodal mobility.

Mobility and Autonomous transport



Security

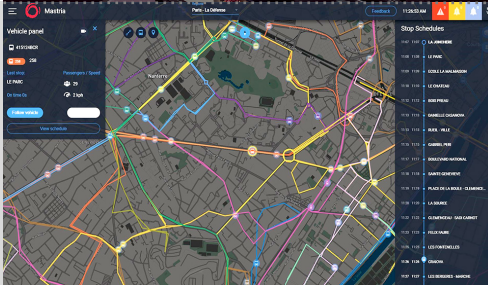
Design and validate increasingly autonomous and connected transport systems in operational, complex and open contexts.

Strengthen performance control in the face of the cyber vulnerability of these communicating, interoperable and evolving systems.



Adaptability

Improve the acceptability of autonomous and connected transport systems by addressing the "human factors" and "human-machine interactions" aspects for systems that are customizable and adaptable to the context of the environment.



Durability

Plan, design and supervise mobility systems by integrating the evolution of urban transport uses. IRT SystemX is part of a Mobility-as-a-Service (MaaS) context, offering users an individualized, door-to-door service integrating different modes of transport with an unified payment method.

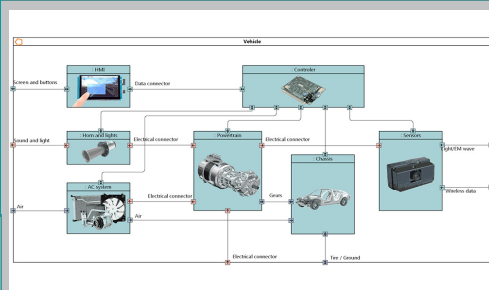


Industry of the future

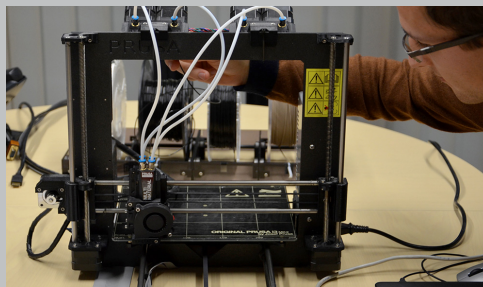
Anticipating the evolution of systems life cycles to reinforce industry performance

Issues addressed:

1 Capitalization on the data



2 Digitalization



3 Connection



Coupling scientific / industrial challenges

Piloting additive manufacturing with new learning methods using heterogeneous data.

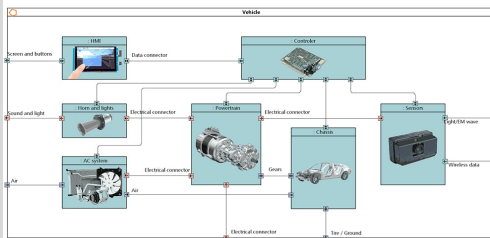
Construction and optimization of large multi-physical models and improvement of design margins.

Performance evaluation of cyber-physical systems in the design phase and choice of architectures.

Continuity of the digital chain and collaborative engineering for the workshop of the future and its supply chain in the extended enterprise.

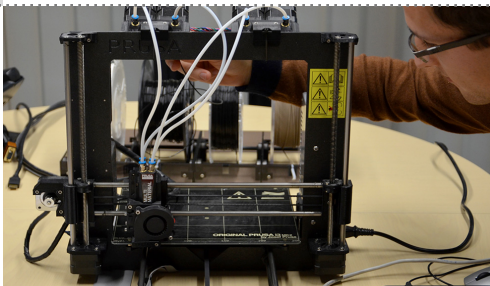
Modeling and optimization of forecast maintenance policies for connected systems.

Detection of heterogeneous weak signals from Internet of Things (IoT) networks for predictive maintenance.



Capitalize

Capitalize on the data generated throughout the life cycle to enable the analysis, forecasting and anticipation of behavioral anomalies of products, processes and equipment and therefore an optimized, simple and robust design.



Digitize

Digitize processes and standardize exchanges through collaboration platforms for the extended enterprise.



Connect

Connect the physical world and the virtual world by collecting operational data in real time to develop digital twins. The aim is to make the best use of products, equipment and infrastructure and to automate and remotely control production or testing processes.



Defense and Security

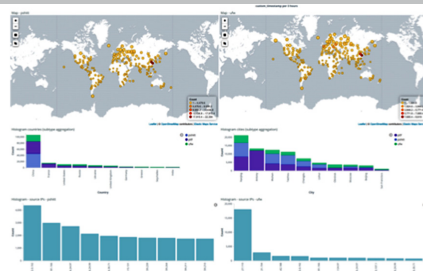
Developing complete security solutions for a trusted digital economy

Issues addressed:

1 Digital protection



2 Detection



3 Supervision



Coupling scientific / industrial challenges:

Securing the software life cycle for maintaining the safety of industrial infrastructures.

Light cryptography for Internet of Things (IoT) ensuring the integrity of data exchange.

Optimized deployment of anomaly detection probes in heterogeneous information systems.

Authentication mechanism to ensure the digital identity and associated access rights of third-party maintenance operators.

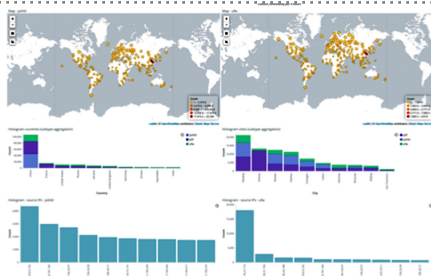
Performance evaluation of remote-controlled autonomous mobility systems and design of adequate supervision systems.

Massive processing and visualization of multi-source data for Supervision and Security Centers (SOC).



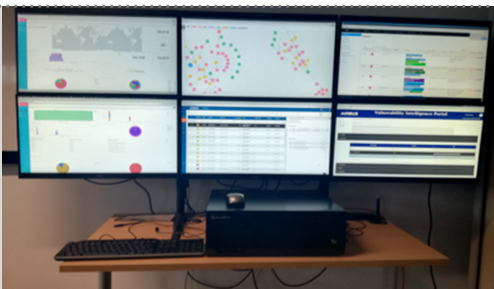
Protection

Accelerate the integration of a holistic approach to cybersecurity systems.
Improve data and digital identity-based trust driven by current regulations and future developments.



Detection

Study the development of intrusion detection capabilities.
Promote multi-source approaches to build more relevant decision spaces from artificial intelligence technologies.



Supervision

Exploit steering information in supervisory systems to detect "abnormal" behavior and trigger remediation actions.
Integrate the latest proposals for graphical representation of data and convergence of infrastructures within the new generation of supervision centers.



**Environment and
Sustainable development**

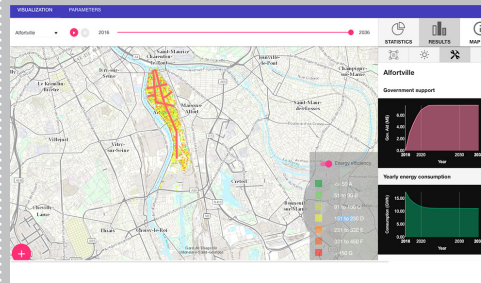
Harnessing the potential
of digital technology to
support the ecological
transition

Issues addressed:

1 Circular economy



2 Prediction and planning



3 Systemic transition



Coupling scientific / industrial challenges:

Design of decision support systems to optimize the management and treatment of recyclable products in a territory.

Establishment of a green bond market place.

Modeling and predicting the demand for citizen consumption and the management of massive data and their visualization.

Use of individual energy production / consumption data for collective optimization while preserving privacy.

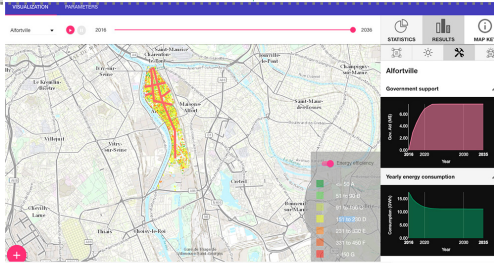
Evaluating scenarios of systemic temporal, spatial and technological changes at the territorial scale.

Construction of predictive models of behavioural changes and their impacts on the evolution of infrastructures.



Circular economy

Analyze and model the life cycles and dynamics of large-scale, complex socio-technical systems in order to help manage them in a circular economy perspective. Propose decision support tools and appropriate performance indicators to optimize the circular economy of the territories.



Prediction and planning

Explore and exploit heterogeneous multi-source data to understand territories and urban systems integrating and user behaviors to predict future patterns and propose recommendations for ecological behavior. Propose decision support tools to make territorial policy recommendations that promote sustainable development.



Systemic transitions

Evaluate the benefits and implications of structural changes in interdependent systems (such as energy and transport), industrial and private uses. Propose recommendations and good practices to accompany systemic transitions.

A SCIENTIFIC DYNAMIC



355
Publications



PhD students /
Trained doctors



4
Docent
Habilitation
(HDR)



27
Partner
laboratories



46
Seminar@SystemX



22
Workshops organized
or sponsored

Data science and AI



LSS - CS
GRETTIA – Ifsttar
MICS - CS
LRI – Inria
LIP6 – Paris 6

Human-computer interaction



LIMSI – CNRS
CEA List
IMS - ENSC

Scientific computation



MICS - CS
LURPA – ENS PS
QUARTZ – Supmeca
JLL – Paris 7
LMV – UVSQ

Optimization



CERMICS - ENPC
LGI - CS
LRI – CNRS
GRETTIA – Ifsttar
LIX – X

Systems engineering and safety



U2IS - ENSTA
LGI - CS
LTCI - TPT
DAVID - UVSQ

Dependability of critical systems



LSV – ENS PS
LRI – CNRS
Heudiasyc – UTC

Digital security And blockchain



LTCI - TPT
Samovar - TPT
CEA List
Grace - Inria

IoT and future networks



LTCI - TPT
Samovar - TPT
LINCS

Involvement in ambitious upstream initiatives



Member of the largest
French research collective
dedicated to blockchain

Partners:



Co-chairing a Chair
on eco-innovations
for user-centered
mobility systems

Partners:



Partner of LINC'S,
International Laboratory
on Networks and Services
of the Future

Partners:



A NATIONAL AND INTERNATIONAL STRATEGY

Becoming a reference at the global and international levels



Mobility and
Autonomous transport



Industry of the
future

Boost

- Develop new use scenarios and perform remarkable experiments
- Expand our circle of industrial partners
- Associate our collaborative system with regional structures (e.g. competitiveness clusters)
- Address the scientific barriers with the laboratories of the territory

Improve

- Accelerate technological use for the regional fabric of SMEs
- Value our assets
- Combine our ability to produce proof of concepts with regional tools
- Position our regional skills in European projects



Mobility and
Autonomous transport



Industry of the
future



Defense and security



Environment and
Sustainable
development

Advance

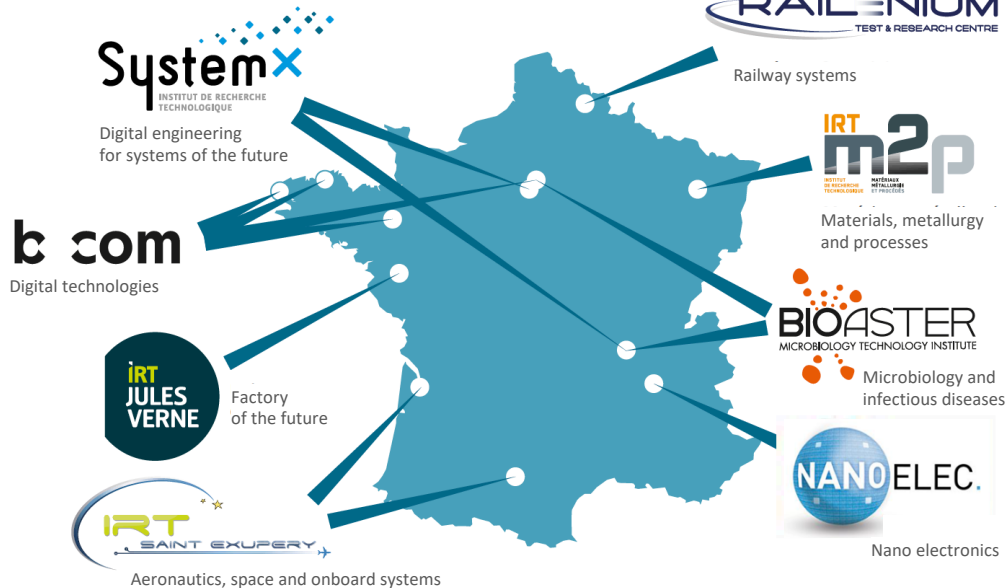
- Partner with academic actors of excellence
- Develop our talents

Improve

- Assist the development of our industrial partners in Asia
- Perform innovative experiments in France

Boost

- Accompany FIT member institutes
- Technically support our industrial partners



Four objectives:

- Attractiveness of the IRT as a model that can be promoted
- Relations with the European Commission
- Cooperation and sharing of best practices
- Consistency among the various objectives in the Future Investment Program

Key figures:

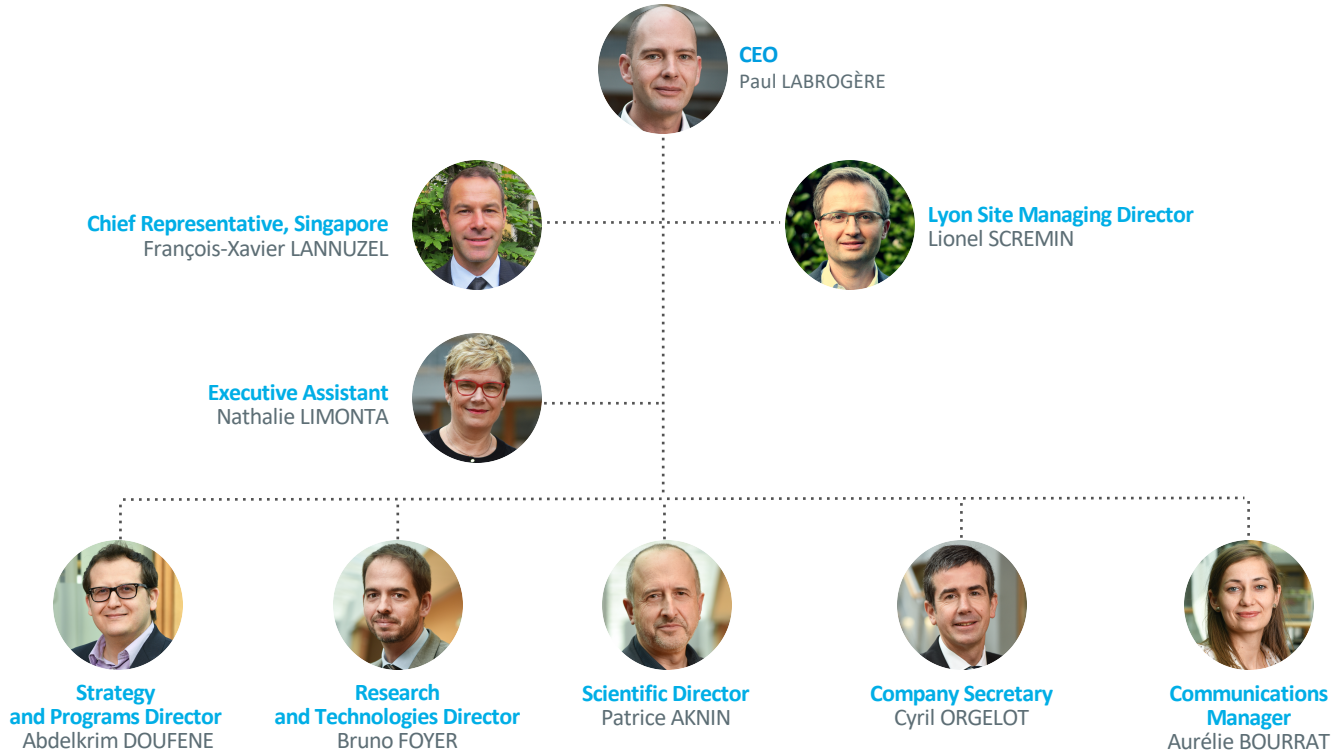
- 8 IRTs established since 2012
- 10-year budget of €2.5 billion
- 500 partners
- 1200 employees

Characteristics of the model:

- Close ties with a research hub
- Partner personnel working side by side at one site
- Funding (Future Investment Plan) for 50% of costs

AN ADAPTED GOVERNANCE





Scientific and Technological Council



Yves BAMBERGER
Académie des
Technologies
Founding Member



Patrick BASTARD
Renault
Responsible for an
operational department
covering ADAS and chair of
3EA activities



Nozha BOUJEMAA
Median Technologies
Chief Science &
Innovation Officer



Olivier CAPPÉ
CNRS
Research Director,
Director of the
Université Paris-Saclay
STIC department



Yves CASEAU
Michelin
Chief Information
Officer



Gilles DOWEK
Inria et ENS Paris-Saclay
Research Director



Serge FDIDA
Université Pierre
et Marie Curie
Professor



Jean-Claude BOCQUET
*President of Scientific
and Technological Council*
CentraleSupélec
University Professor



Denis GARDIN
MBDA Systems
Director of Innovation in
Forward-Looking Technology



Bertrand MAURY
Université Paris-Sud
University Professor



Michèle SEBAG
CNRS, LRI, Académie
des Technologies
Research Director,
Deputy Director of LRI



Bruno SUDRET
ETH Zürich
Professor and Director of
research and strategy at
Phimeca Engineering



Alain Bravo
Académie des Technologies
President



Guillaume POUPARD
ANSSI
CEO

2 permanent guests



Jean-Noël PATILLON
CEA LIST



Didier DUMUR
CentraleSupélec



Bernard YANNOU
CentraleSupélec



François ALOUGES
École polytechnique



Bruno MONSUEZ
ENSTA ParisTech



Brigitte DUEME
Inria



Yves SOREL
Inria



Hervé DEBAR
Institut
Mines-Télécom



Laurent PAUTET
Institut
Mines-Télécom



Samir TOHME
Université de Versailles-
Saint-Quentin-en Yvelines



Philippe DAGUE
Université Paris-Sud



Éric DUCEAU
Airbus Group



Louis GRANBOULAN
Airbus Group



**Anthanasios
KONTOPOULOS**
Air Liquide



Pascal POISSON
Alstom



Jacques DUYSSENS
ANSYS



Élie ZNATY
Bertin Technologies



**Nathalie
MERCIER-PERRIN**
Naval Group



Philippe CALVEZ
ENGIE



Catherine DEHAENE
Orange



Helene Bachatene
Thales



François Gaillard
PSA Groupe



Ludovic Noirie
LINC/S/Nokia



Véronique BERTHAULT
RATP



Alain DAURON
Renault



Jean-Marc DAVID
Renault



Frédéric FEYEL
Safran



Michel Pinget
Dassault Aviation



Philippe ROY
Cap Digital



Johan D'HOSE
Systematic Paris-Region

THANKS FOR YOUR ATTENTION

